UNIT II

RCM PROCESS

Module 5

RCM DECISION LOGIC

RCM DECISION LOGIC

Module Preview:

Introduction

Introduction

RCM Decision Logic

Failure Consequences

Task Evaluation

Task Selection

Review and Summary

RCM DECISION LOGIC

Module Objectives:

Introduction

1. **Describe the RCM Decision Logic**

2. **Identify the four types of failure consequences that make up the branches of the RCM Decision Logic tree**

3. **Describe the RCM Task Evaluation Process**

RCM DECISION LOGIC

Module Objectives:

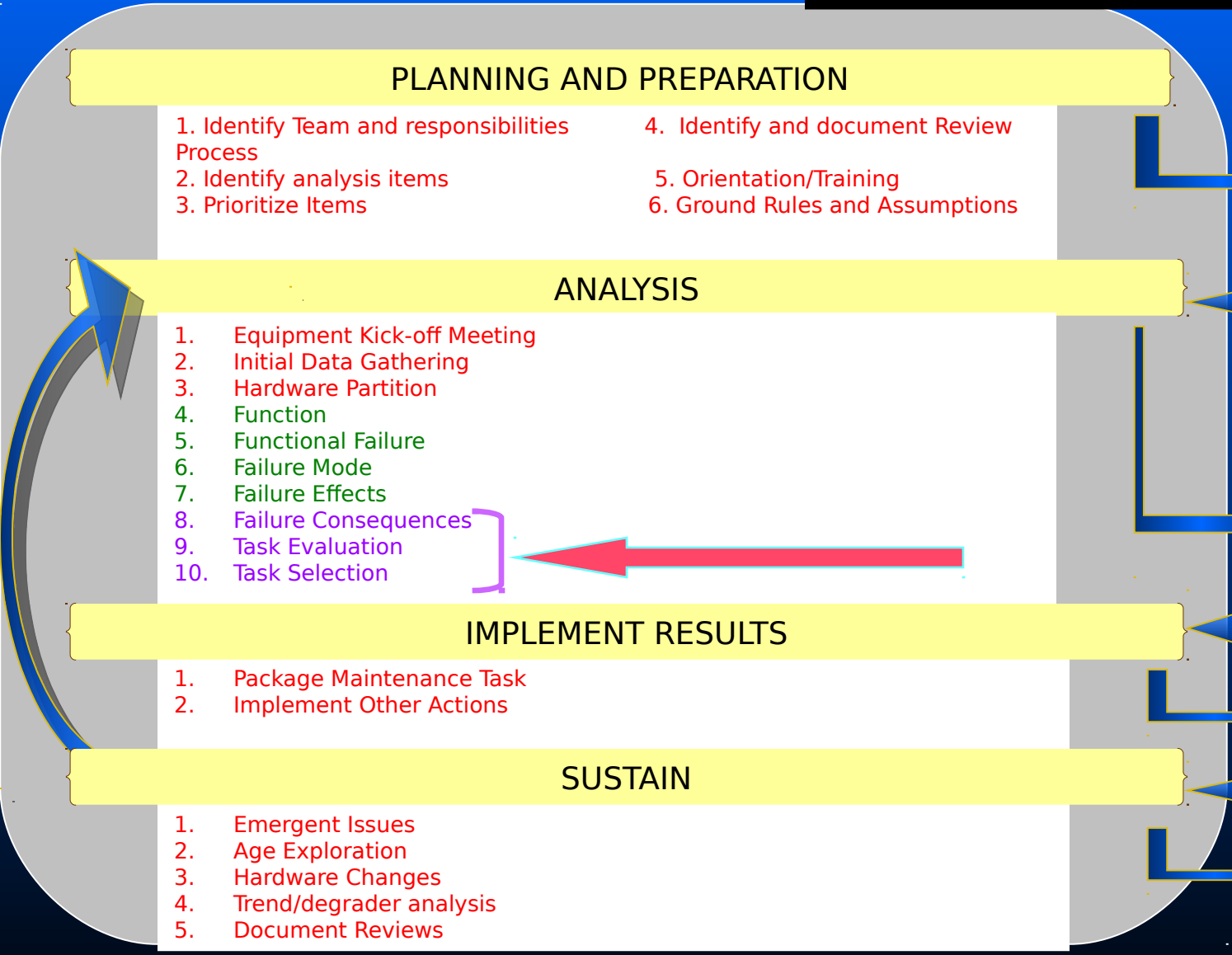
Introduction

4. Identify the following task types:
   - Servicing
   - Lubrication
   - On Condition
   - Hard Time
   - Failure Finding
5. Introduce the RCM Task Selection Process

end

RCM Process

RCM Decision Logic



Results

- Analysis Approach/ RCM Plan
- Maintenance Requirements
- Maintenance Program
- Data

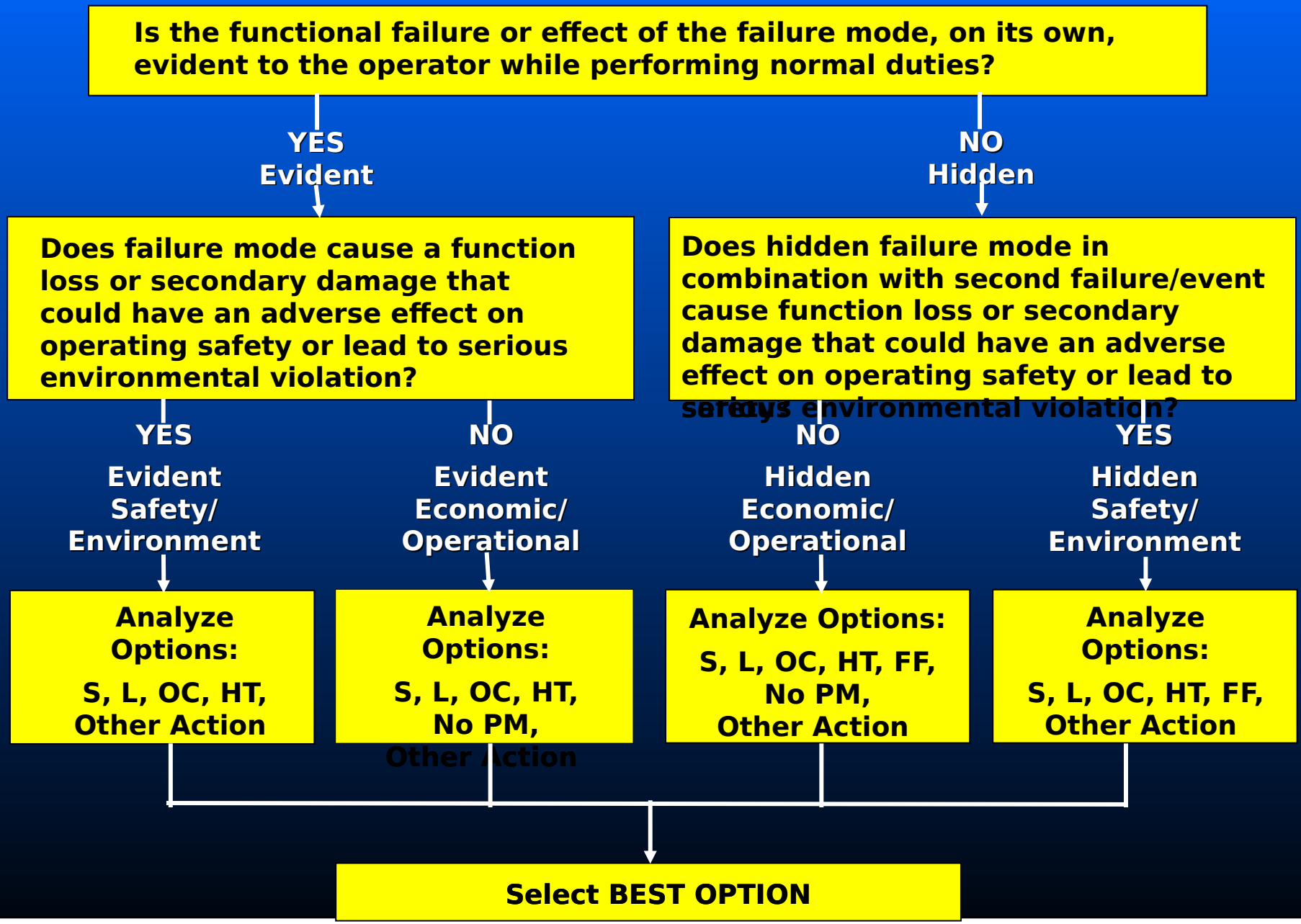
RCM DECISION LOGIC

Purpose:

RCM Decision Logic

RCM DECISION LOGIC

Process used to determine what action should be taken to eliminate or lessen the consequences that result from the occurrence of a failure mode


Is the functional failure or effect of the failure mode, on its own, evident to the operator while performing normal duties?
YES
Evident
NO
Hidden
Does failure mode cause a function loss or secondary damage that could have an adverse effect on operating safety or lead to serious environmental violation?
Does hidden failure mode in combination with second failure/event cause function loss or secondary damage that could have an adverse effect on operating safety or lead to serious environmental violation?
YES
NO
NO
YES
Evident Safety/ Environment
Evident Economic/ Operational
Hidden Economic/ Operational
Hidden Safety/ Environment
Analyze Options:
S, L, OC, HT, Other Action
Analyze Options:
S, L, OC, HT, No PM, Other Action
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Analyze Options:
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Select BEST OPTION

RCM DECISION LOGIC

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Use of : **Failure Consequences**

Failure consequences: **the impact that the effects of a failure have on safety, operations, and the environment … and whether the failure is evident to the operator**

When the failure consequences warrant attention, the goal of RCM is to control the consequences by:

- ***avoiding them (reducing their frequency)***
- ***reducing their severity***

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Identifying: **Failure Consequences**

- *Failure consequences are categorized in two steps:*
  - *Hidden or Evident*
  - *Safety/Environment or Operational/Economic*

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Identifying: **Failure Consequences**

Failure Consequences Step 1:

- **Evident Failure**: ***A failure that, by itself, is apparent to the operator under normal circumstances***

- **Hidden Failure**: ***A failure that is not apparent to the operator under normal circumstances***

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Question 1:

Failure Consequences

EVIDENT - *Apparent to operator without special monitoring.*

OPERATOR – *Crew/Equipment Operator*

Is the functional failure or effect of the failure mode, on its own, EVIDENT to the OPERATOR while performing NORMAL DUTIES?

Evident — YES

Hidden — NO

Does the failure mode cause a function loss or secondary damage that could have an adverse effect on operating safety or the environment?

Evident Safety/ Environment — YES

Evident Economic/ Operational — NO

Does the occurrence of the hidden failure mode in combination with a second failure /event cause a function loss or secondary damage that could have an adverse effect on operating safety or the environment?

Environment

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Identifying: **Failure Consequences**

Failure Consequences Step 2:

The evident and hidden groups are further divided based on failure effects:

#1

- **Safety**
- **Environment**

#2

- **Operations**
- **Economics**

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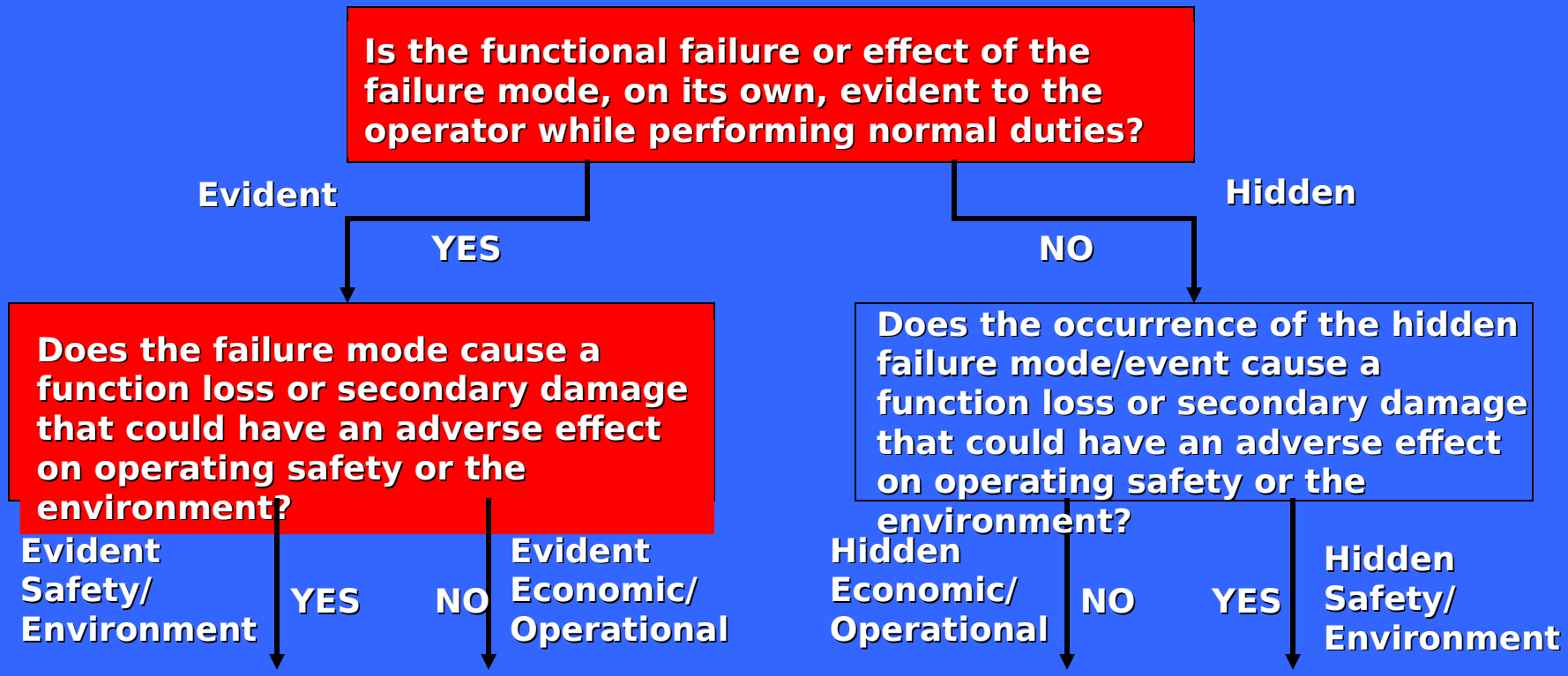
Question 2: Failure Consequences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YES
Hidden
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Does the failure mode cause a function loss or secondary damage that could have an adverse effect on operating safety or the environment?
Evident Safety/ Environment
YES
NO
Evident Economic/ Operational
Does the occurrence of the hidden failure mode/event cause a function loss or secondary damage that could have an adverse effect on operating safety or the environment?
Hidden Economic/ Operational
NO
YES
Hidden Safety/ Environment

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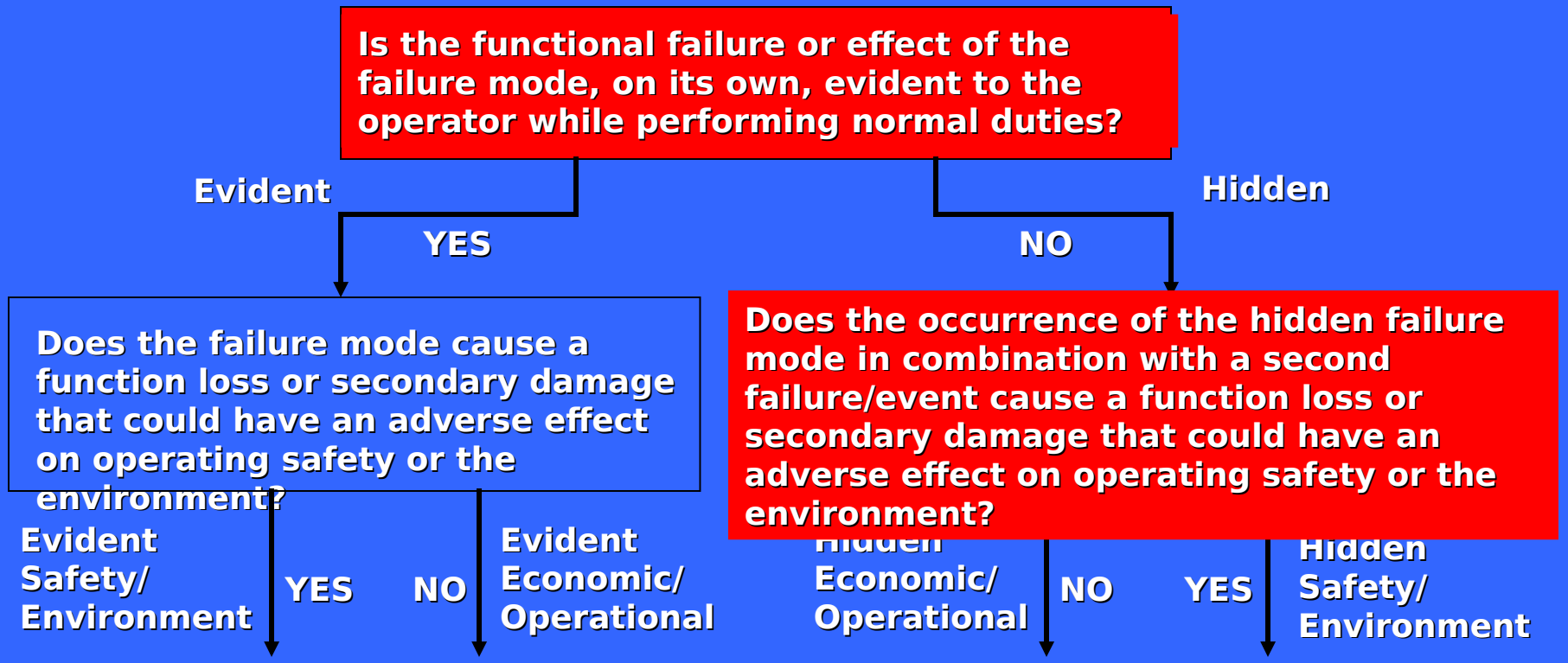
Question 3: Failure Consequences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Hidden Economic/ Operational
NO
YES
Hidden Safety/ Environment

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Categories:

Failure Consequences

In summary, failures are categorized by consequences.

RCM uses four categories:

- **Evident Safety/Environmental**
- **Hidden Safety/Environmental**
- **Evident Economical/Operational**
- **Hidden Economical/Operational**

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Managing: **Failure Consequences**

Evident failure:

- **Eliminate/reduce the consequence of single failure**

Hidden failure:

- **Eliminate/reduce consequences of multiple failure**
- **Eliminate/reduce economic consequence of single failure**

A Multiple Failure is a *combination of a hidden failure plus a second failure or other event that makes the hidden failure evident*

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Managing: **Failure Consequences**

Safety/Environmental failure:

- **Must prevent the consequences of failure**

Economic/Operational failure:

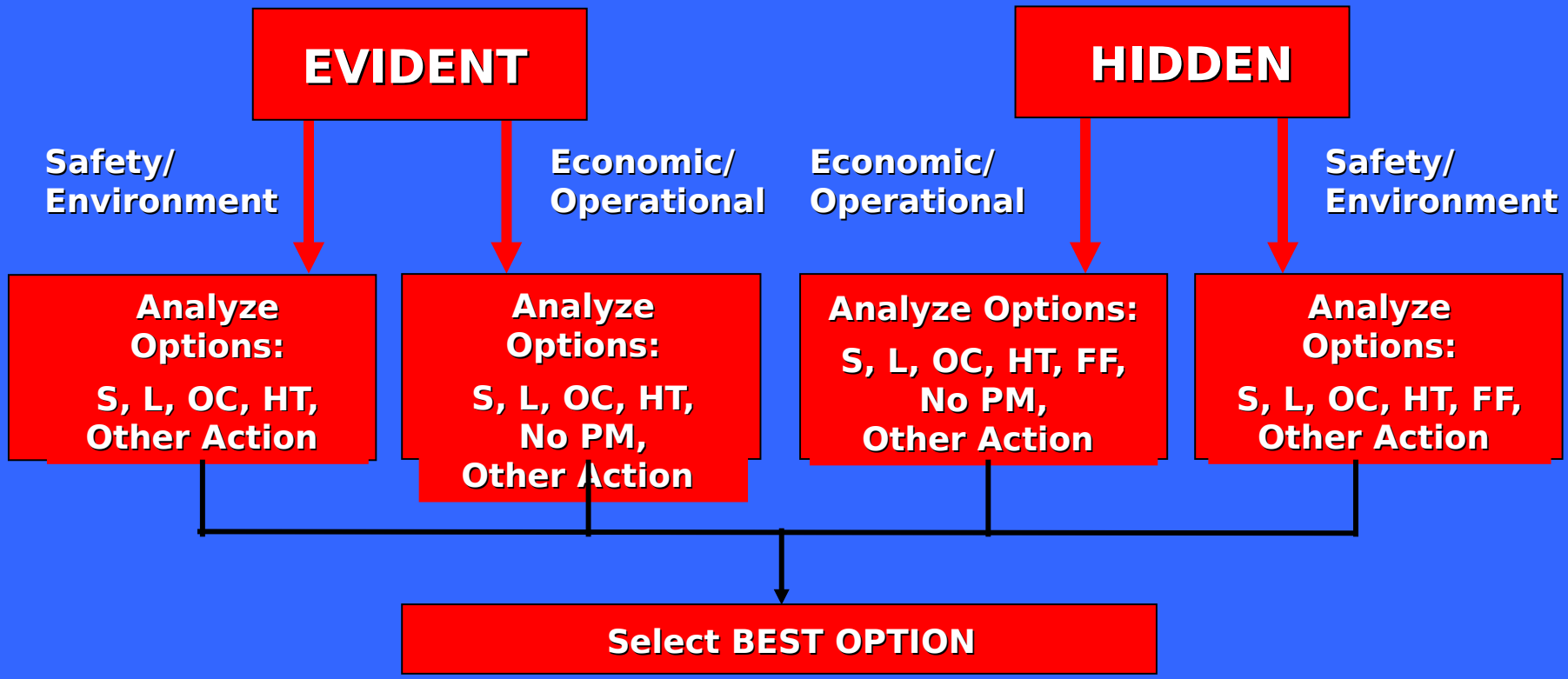
- **Prevent or allow failure**

Summary: RCM decision logic process provides the appropriate management strategies for each consequence category

RCM DECISION LOGIC

Consequences Branches:

Failure Consequences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Select BEST OPTION

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RCM DECISION LOGIC

Purpose:

Task Evaluation

To determine what actions can be taken to prevent a failure mode from occurring; or, if not prevented, to lessen its effects to an acceptable level.

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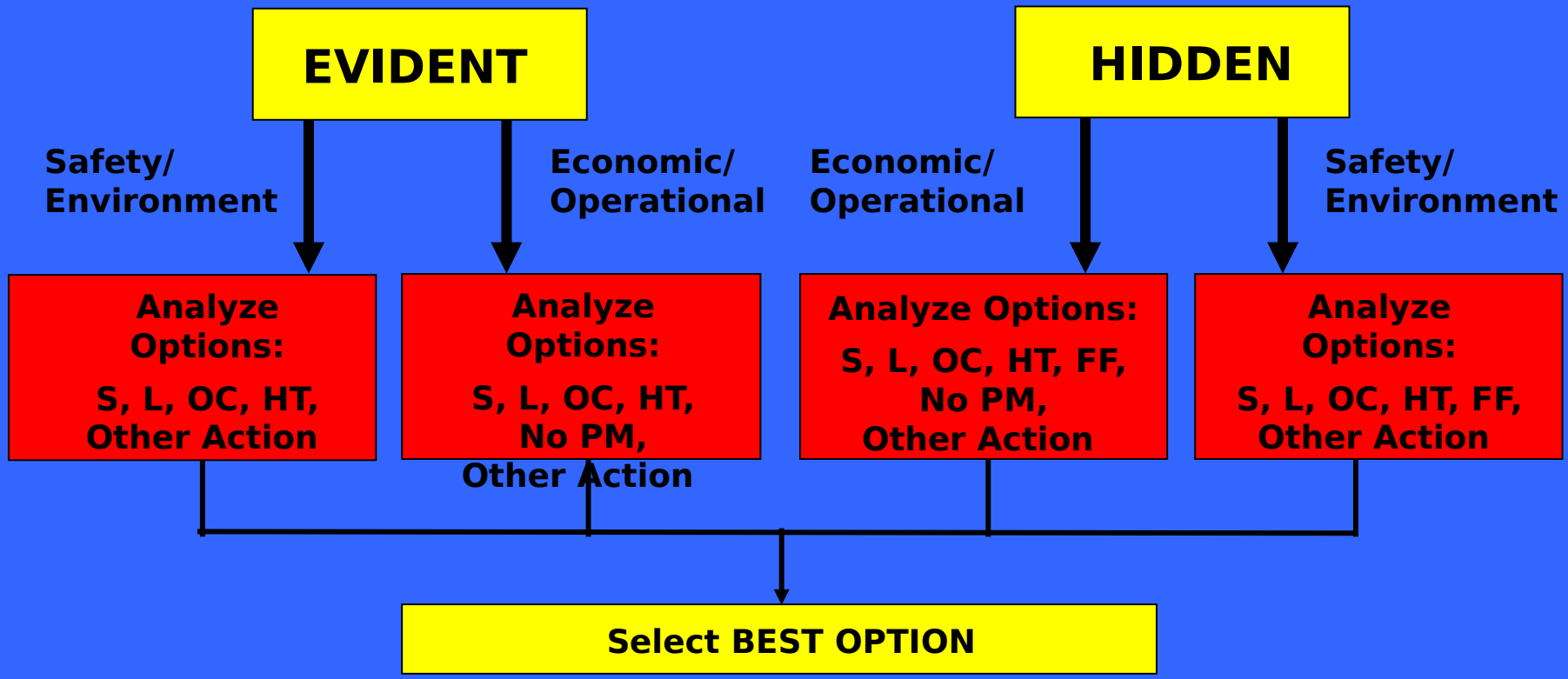
Preventive Maintenance Tasks: Task Evaluation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Servicing:

Task Evaluation

The replenishment of consumable materials that are depleted during normal operations.

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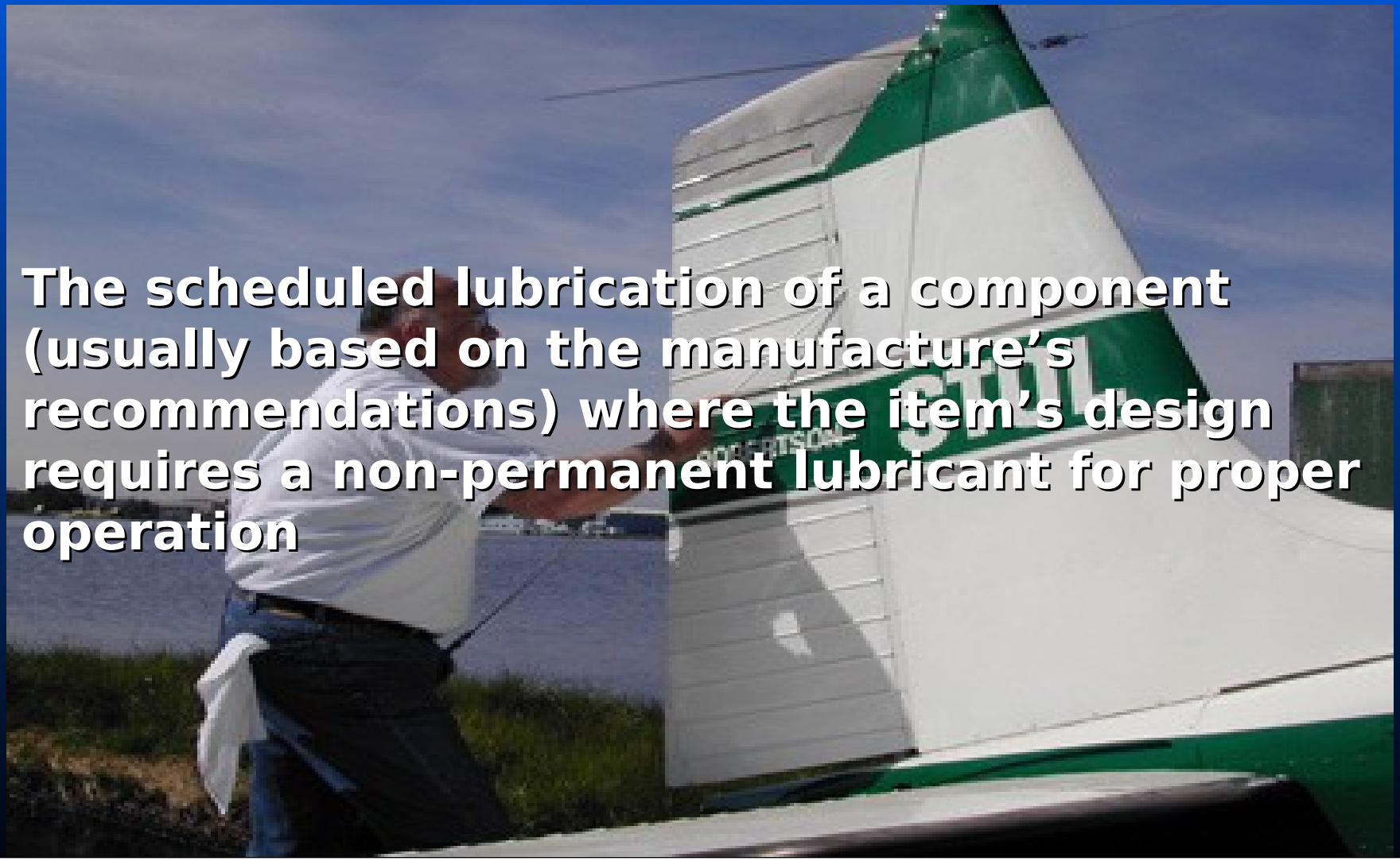
Lubrication:

Task Evaluation



The scheduled lubrication of a component (usually based on the manufacture's recommendations) where the item's design requires a non-permanent lubricant for proper operation

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On-Condition

Task Evaluation

Periodic or continuous inspection designed to detect a potential failure condition prior to functional failure.

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Hard Time Task:

Task Evaluation

Scheduled removal of an item or a restorative action at some specified age limit to prevent its functional failure.

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Failure Finding:

Task Evaluation

A preventive maintenance task performed at a specified interval to determine whether a hidden functional failure has occurred.

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Preventive Maintenance Tasks:

Task Evaluation

- ***S (Servicing Task)*** **- Replenishment of consumable materials depleted during normal operations**
- ***L (Lubrication Task)*** **- Replacement of a lubricant based on manufacturer's predicted or measured life of the lubricant**
- ***OC (On Condition Task)*** **- Periodic or continuous inspection designed to detect a potential failure condition prior to functional failure**
- ***HT (Hard Time Task)*** **- Scheduled removal of an item or a restorative action at some specified age limit to prevent its functional failure**
- ***FF (Failure Finding Task)*** **- A preventive maintenance task performed at a specified interval to determine whether a hidden functional failure**

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Other Action Warranted:

Task Evaluation

Other Action: Usually a one time action, other than PM, that will effectively reduce the consequences of failure to an acceptable level

- **Item redesign**
- **Change in an operational or maintenance procedure**
- **Operating restrictions**
- **Etc.**

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Other Action Warranted:

Task Evaluation

Consider when

- **No acceptable PM task can be found for safety/environmental consequence failures**
- **Other Action is preferable to PM and run to failure**
- **Other action, in combination with PM, will beneficially reduce consequences or frequency of failure**

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RCM Decision Logic Results:

Task Evaluation

Once a failure mode is subjected to the RCM Decision Logic, at least one of the following outcomes will result:

- **PM Required**
- **No PM Required**
- **Other Action Warranted**

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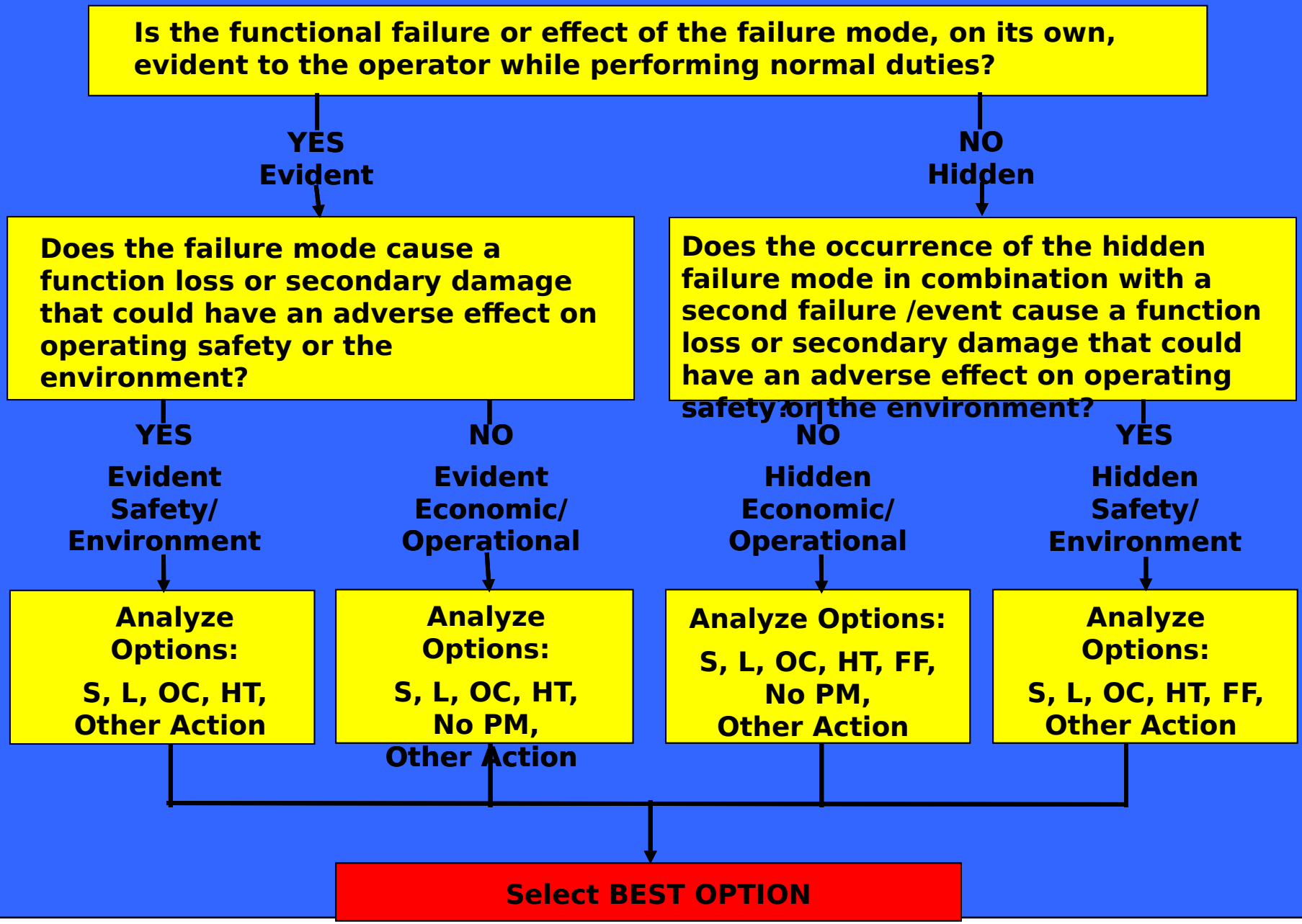
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Select BEST OPTION

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Selection Process:

Task Selection

One or more PM tasks may prevent or reduce the probability of failure to an acceptable level. These tasks along with…

- **a decision to allow the failure mode to occur (no PM)**
- **some “other action”…**

… form a pool of options from which solutions can be generated.

RCM DECISION LOGIC

Review and Summary

- **Module Objective**
- **Introduction**
- **RCM Decision Logic**
- **Task Evaluation**
- **Task Selection**

End of Module

up next.....

UNIT III

RCM Software Review